d. Technical magazines.

1. *Scientific American.* Munn and Co., N. Y.

2. *Scientific American Supplement.* Munn and Co.

e. Every teacher who can read either French or German should try to read at least one journal in either of these two languages.

2. Of a General Nature.

a. School Review. University of Chicago Press.

b. School and Society. Science Press, Garrison, N. Y.

These two magazines are two of the most stimulating and helpful sources of information for high school teachers.

DISCUSSION

A Few Lessons in Calculus for High Schools. The National Committee on Mathematical Requirements has stated that some work in calculus could well be taken in high school. As the idea appealed to us, we decided to have sueh a course here—a very short course, about twenty lessons.

The next thing was to find a suitable textbook, and here arose a serious difficulty. Almost all the American textbooks were written from a college point of view. They were too heavy. Certain English books came much nearer the desired field. As none of these was entirely satisfactory, we decided to arrange our own course.

We made the aim to give the pupil an acquaintance with a few of the simplest applications of calculus. For content we limited the field to the so-called practical problems, leaving out the more abstract work. And as differentiation and integration have many forms we omitted all work with logarithms and trigonometric functions of angles. The three main topics selected for problems were, Variable Rates of Motion, Maxima and Minima, and Finding Areas and Volumes. About twenty-five easy problems were collected for each group, samples of which are given later. Then enough theory with exercises was supplied to prepare for the problems. The drill exercises to a large extent were taken from the problem work. Oifferentials included the coefficient, the constant term, the sum, the product,

the power, the root, and the quotient. Integrals included the constant term, the coefficient, the sum, and the power. There was much graphic representation. The eight chapters are:

1. First Principles.
2. Differentials.
3. The Derivative.
4. Rates of Motion.
6. The Second Derivative.
7. Integrals.
8. Distance, Area and Volume.
5. Maxima and Minima.

Sample problems follow:

A lamp is 60 ft. above the ground; a stone is dropped from a point at the same level as the lamp and 20 ft. away from it. Find the rate of the shadow of the stone on the ground after 1 sec.; after falling 30 ft.

A boat 15 mi. south of a lighthouse sails due east at the rate of 10 mi. per hour. At what rate is the boat leaving the lighthouse after 2 hours?

A man is walking 4 ft. per second across a bridge; a second man in a motorboat is going at right angles from the bridge 6 ft. per second. At what rate are the men separating after 5 seconds?

The formula for the distance traveled by a stone thrown upward into the air, with a velocity V_0, is $s = V_0T - \frac{1}{2}gt^2$. Find the greatest height reached by the stone.

A window is in the form of a rectangle surmounted by a semi-circle. If the perimeter is 30 ft., find the width so that the greatest possible amount of light may be admitted.

The number of tons of coal consumed per hour by a ship is $.3 + .001V^3$ where V is the speed. For a voyage of 1,000 mi., find the total consumption of coal; then find for what speed the coal consumption is the least.

Find where the curve $y = 1 - x^2$ cuts the x axis and then find the area between the curve and the x axis.

Find the volume generated by the hyperbola $y = \sqrt{1 + x^2}$ revolved about the x axis, between the limits $x = 0$ and $x = 4$.

Find where the ellipse $4x^2 + 9y^2 = 36$ cuts the y axis and then find the volume of the ellipsoid made by the ellipse revolved about the y axis.

A boat is fastened to a rope which passes over a wheel 20 ft. above the level of the boat. If the rope is passing out at the rate of 8 ft. per second, how far is the boat from the wharf? The boat is drifting down stream at the rate of 10 ft. per second constantly.

This course in mimeographed form has been tried out in an elective class of the better type of seniors meeting once a week and has held their interest and activity.

Robert R. Goff.

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Vitalizing Instruction in Geometry. I visited a class in geometry in which all of the girls—it was a class of girls only—went to the blackboard where a carefully drawn copy of the figure "in the book" lettered just so, and carefully set so that it would not tip over, awaited them.

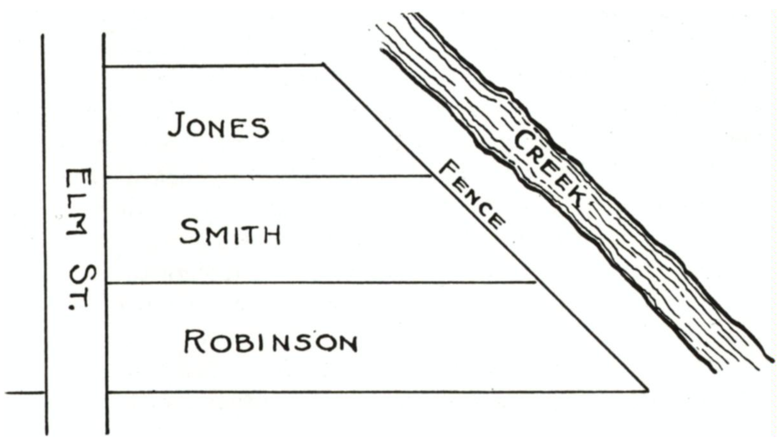
Each girl in her turn went through the demonstration in the exact words of "the book," and everybody, teacher and pupils, was happy—except the visitor.

The theorem set up the claim—and proved it—that a line drawn parallel to the base of a right angled triangle divides the other two sides proportionally.

Believing that no one of the seven really understood the theorem, or appreciated its value, I could not quite console myself with the sage reflection that fortunately they would forget the whole thing in a short time.

Therefore, after gaining permission from the teacher, I put this to the girls:

> "Once there were three men—Jones, Smith and Robinson —who owned town lots fifty feet wide, side by side, fronting on Elm Street, like this:



> "Back of their lots ran a creek, and since they all had little children who might fall in and be drowned, they hired a man to build a wire fence at the rear of their lots along the creek. When he presented the bill, $28.50, the question arose how they should divide it. What do you think about it? Which of the three should pay the largest part of the bill?"

We took a vote and every girl voted for Robinson. Why? I never found out. After they were thoroughly committed, I completed the triangle and showed them that each of them had

just carefully proved to me that the bill should be equally divided—$9.50 for each man.

There were "Oh's" and "Ah's," and there was genuine surprise that anything in a geometry book had anything to do with real life. Even the teacher showed similar symptoms!

I remembered what some cruel iconoclast had said to the effect that geometry was invented as a means of intellectual recreation for a group of highly trained philosophers in Athens whose minds sought for statements and processes of logic as thoroughly abstract as possible—and then we feed it—just as it has lain in its two thousand year packing—to children fifteen years old. No wonder the more enterprising classes burn their geometries with ceremony!

And I asked myself why we could not have all, or most of our geometrical theorems presented as concrete problems taken from familiar environment and let the pupils guess at it a while —even if they "guess" Robinson!—and then assign "for tomorrow" a theorem which will tell how to divide the bill fairly.

Youthful psychology is a fairly safe guide in lesson assignment, O ye pedagogues, to say nothing of classroom conduct.

And, would it be too bold to suggest that youthful psychology be given some consideration in the writing of textbooks?

Unless we heed this lesson, the reformers are going to sweep out all the broken idols—beautiful marble though they may be—and substitute mechanical puppets and toys, because they have joints and youth can work them!

All reforms should come from *within*. Most of them come from *without*, and are reckless and destructive and wasteful.

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